

## NOTES ON AUSTRALIAN VERRUCARIACEAE (LICHENES): 2

by

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### ABSTRACT

McCarthy, P. M. Notes on Australian Verrucariaceae (Lichenes): 2. *Muelleria* 7(3): 317-332 (1991). *Catapyrenium bullatescens* McCarthy, *Verrucaria australiensis* McCarthy, *V. hydrela* var. *puncticulata* McCarthy, *V. operculata* McCarthy, *V. subdiscreta* McCarthy and *V. tessellatuloidea* McCarthy are described as new from Australia. *Polyblastia cupularis* Massal., *Thelidium olivaceum* (Fr.) Körber, *V. dufourii* DC., *V. glaucina* Ach., *V. hydrela* Ach. and *V. striatula* Wahlenb. are reported for the first time from the continent. *Verrucaria halizoa* Leighton is the correct name for *V. cribbii* Rogers. A key to the marine and maritime Verrucariae presently known from Australia is provided.

### INTRODUCTION

An examination of specimens housed in the major institutional herbaria in Australia and a more thorough survey of those collections in the National Herbarium of Victoria which might be expected to include Verrucariaceae indicates that the type genus is most diverse in the south-eastern states and in coastal areas of South Australia. This finding is not unexpected given the preference of *Verrucaria* for temperate and boreal environments in the Northern Hemisphere. Moreover, because the genus is also predominantly calcicolous, this combination of macroclimatic and substratum preferences should be helpful in locating those centres of greatest diversity in Australia.

Of the four marine and maritime Verrucariae included in the Third Edition of the 'Checklist of Australian Lichens' (Filson 1988), only two, *V. maura* Wahlenb. and *V. microsporoides* Nyl., have been reliably recorded. *Verrucaria ceuthocarpa* Wahlenb., reported by Müller (1893) from Warrnambool, Victoria, was stated to be "sine apotheciis"; its identity, therefore, must remain doubtful. Furthermore, Müller's report of *V. mucosa* Wahlenb. from Sandringham, Victoria bears the qualification "male evoluta" (Müller 1893); this material, in the National Herbarium of New South Wales, corresponds to *V. microsporoides* Nyl.

Recently, Rogers (1988) described *V. cribbii* from Heron Island, a tropical coral cay in Queensland. Intertidal Verrucariae have rarely been observed at such latitudes; they usually occupy a climatic gradient ranging from temperate to sub-polar. Whereas, *V. cribbii* occupies an unusual environment, in terms of its thalline and perithecial morphology it agrees with *V. halizoa* Leighton (syn. *V. microspora auct. angl. non* Nyl.).

The present contribution includes the descriptions of six new taxa together with new records of ten others, mainly from southern and south-eastern Australia. A key to the six marine and maritime species currently accepted for Australia is provided.

### TAXONOMY

#### 1. *Catapyrenium bullatescens* McCarthy, *sp. nov.*

*Thallus* squamulosus, terricolus, brunneus, 0.2-0.4(-0.5) mm crassus. *Squamulae* contiguae vel imbricatae, 1-2(-3) mm latae, rotundatae, elongatae vel irregulares, primum planae, deinde convexae vel bullatae, hebetatae, laevigatae vel rugulosae, saepe leviter rimulosae, ad marginem deflexae, integrae vel leviter lobatae, nunquam profunde incisae. *Stratum* epinecrale

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incolortum, 7–15  $\mu\text{m}$  crassum. *Cortex* bistratus, superior prosoplectenchymatus, inferior paraplectenchymatus, 40–60(–80)  $\mu\text{m}$  crassum. *Stratum* algarum (0.07–)0.1(–0.15) mm crassum; cellulae globosae, virides, 7–12(–14)  $\mu\text{m}$  diametro. *Medulla* 0.07–0.2 mm crassa; cellulae hypharum 8–15  $\times$  4–6(–8)  $\mu\text{m}$ . *Cortex* infernus margine pallido-fuscus, interne fusco-ater, 20–30  $\mu\text{m}$  crassus; cellulae hypharum rhizoidealium 15–30  $\times$  (4–)6(–8)  $\mu\text{m}$ . *Perithecia* simplices, immersa, plerumque solitaria, 0.35–0.5 mm diametro. *Apex* perithecii niger, planus vel leviter convexus, 0.25–0.38 mm diametro. *Ostium* inconspicuum vel leviter depressum. *Excipulum* praecipue incolortum vel pallido-spadiceum, fuscans prope apicem, 26–36  $\mu\text{m}$  crassum; cellulae 8–20  $\times$  3–6  $\mu\text{m}$ . *Centrum* globosum, 0.3–0.44 mm diametro. *Periphyses* 25–40  $\times$  1.5–2  $\mu\text{m}$ . *Paraphyses* evanescentes. *Asci* bitunicati, elongati-clavati, 8-sporei, 90–120  $\times$  10–15(–20)  $\mu\text{m}$ . *Gelatinum hymenii* J+ rubiginosum. *Ascosporeae* simplices, incolortae, elongatae vel latae-ellipsoideae, plerumque seriatae, guttulae, (10.3–)12.8(–15.8)  $\times$  (5.3–)6.3(–7.9)  $\mu\text{m}$ . *Conidiomata* 0.07–0.1 mm diametro, immersa, praecipue incolortata. *Conidia* bacilliformes, 2–3.5  $\times$  0.7  $\mu\text{m}$ .

HOLOTYPE: Australia, New South Wales, Limestone Valley Creek, 9 km NE of Canowindra, 33°36'S, 148°41'E, alt. 460 m, "limestone outcrop in paddock with scattered *Brachychiton* and *Callitris*. On big branches of *Brachychiton*", 8.viii.1979, H. Streimann 9253 (CBG 7911587).

*Thallus* squamulose, terricolous, brown, 0.2–0.4(–0.5) mm thick. *Squamules* contiguous to imbricate, 1–2(–3) mm wide, rounded, elongate or irregular, at first plane, becoming convex to bullate; surface matt, smooth to rugulose, frequently faintly rimulose; margin deflexed, entire to faintly lobate, never deeply incised. *Epinecral* layer colourless, 7–15  $\mu\text{m}$  thick. *Cortex* bi-layered, 40–60(–80)  $\mu\text{m}$  thick; upper layer prosoplectenchymatous, with 1–2 rows of 10–15(–17)  $\mu\text{m}$  diam. cells that have 3–4(–5)  $\mu\text{m}$  thick pale brown walls; lower layer paraplectenchymatous, with 4–7 rows of angular and vertically elongated 9–15  $\times$  6–9  $\mu\text{m}$  cells that have 1.5–2.5(–3)  $\mu\text{m}$  thick colourless walls. *Algal layer* (0.07–)0.1(–0.15) mm thick; cells green, globose, 7–12(–14)  $\mu\text{m}$  diam. *Medulla* 0.07–0.2 mm thick; hyphal cells 8–15  $\times$  4–6(–8)  $\mu\text{m}$ . *Lower cortex* pale brown near the margin, dark brown nearer the centre, 20–30  $\mu\text{m}$  thick; cells 7–15  $\mu\text{m}$  diam., producing a dense growth of rhizoidal hyphae with cells of 15–30  $\times$  (4–)6(–8)  $\mu\text{m}$ . *Perithecia* simple, immersed, usually solitary, 0.35–0.5 mm diam. *Perithecial* apex black, plane to slightly convex, 0.25–0.38 mm diam. *Ostiole* inconspicuous or located in a shallow depression. *Excipulum* colourless to pale yellowish-brown, except near the apex where it is pale to dark brown, 26–36  $\mu\text{m}$  thick; cells 8–20  $\times$  3–6  $\mu\text{m}$ . *Centrum* globose, 0.30–0.44 mm diam. *Periphyses* 25–40  $\times$  1.5–2  $\mu\text{m}$ . *Paraphyses* evanescent. *Asci* bitunicate, elongate-clavate, 8-spored, 90–120  $\times$  10–15(–20)  $\mu\text{m}$ . *Hymenial gel* I+ deep reddish-brown. *Ascospores* simple, colourless, elongate to broadly ellipsoid, usually uni-seriate in the asci, guttulate, (10.3–)12.8(–15.8)  $\times$  (5.3–)6.3(–7.9)  $\mu\text{m}$  (50 individuals measured). *Conidiomata* 0.07–0.1 mm diam., laminal, immersed, with a hyaline wall and an apex that is concolorous with or slightly darker than the thallus. *Conidia* bacilliform, 2–3.5  $\times$  0.7  $\mu\text{m}$ . (Fig. 1)

#### DISCUSSION:

The type specimen of *Catapyrenium bullatescens*, though small, is abundantly fertile and its squamules exhibit a considerable breadth of form. However, its habitat requirements are, as yet, somewhat enigmatic. Thus, whereas the collector's notes suggest a corticolous existence, the squamules grow on a mildly calcareous 'soil' lacking all traces of bark cells. It is probable that the lichen inhabits a primitive soil accumulated in bark fissures and is, therefore, essentially terricolous.

*Catapyrenium bullatescens* possesses a distinctive combination of perithecial and vegetative attributes, namely, unusually large pale-walled ascomata immersed in small tightly packed and imbricate, convex to bullate squamules.

Four *Catapyrenia* are presently known from Australia. They include the cosmopolitan *C. lachneum* (Ach.) R. Sant. s. lat., and *C. compactum* (Massal.) R.

Sant., a blackish squamulose-areolate species of limestone and calcareous lithosol in South Australia and Victoria. Two species, *C. bullatescens* and *C. cinereum* (Pers.) Körber, are known only from New South Wales. The latter, a common arctic-alpine species in the Northern Hemisphere, was collected at an altitude of 2000 m in the Snowy Mountains (McVean 1969); it is a pale grey to grey-brown lichen with minute pruinose squamules and brown-black perithecia.

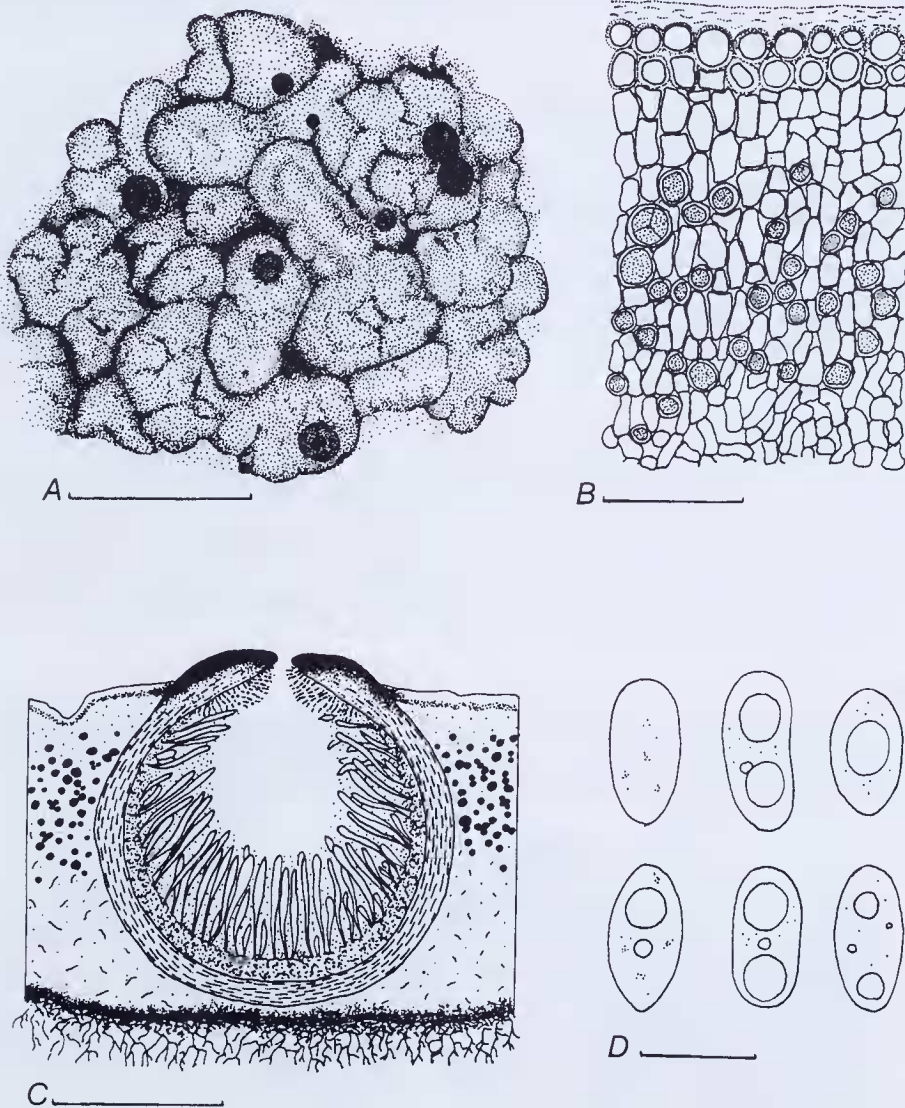


Fig. 1. *Catapyrenium bullatescens*. A — habit; scale 0.2 mm. B — vertical section of thallus showing epinecral layer, cortex and algal layer; scale 50 μm. C — vertical section of perithecium; scale 0.2 mm. D — ascospores; scale 10 μm.

2. *Polyblastia cupularis* Massal., *Ric. auton. lich. crost.*: 148 (1852).

The lichen genus *Polyblastia* is characterized within the Verrucariaceae by the muriform septation of its ascospores combined with the absence of hymenial algae. Such a definition is clearly unsatisfactory given the progressively elaborate ascospore septation that is continuous through both *Thelidium* and *Polyblastia*. The Victorian specimens of *P. cupularis* have a pale grey-brown subepilithic thallus and semi-immersed compound perithecia of 0.3–0.52 mm diam. The colourless ascospores measure 30–55 × 14–20 µm.

Previous reports of *Polyblastia* in Australia are referable to the unrelated and largely non-lichenized *Polyblastiopsis* Zahlbr.; the name *Polyblastia tichospora* (Knight) Shirley, listed by Filson (1988), is a synonym of *Polyblastiopsis tichospora* (Knight) Zahlbr.

SPECIMEN SEEN:

Victoria — Warrnambool, on mortar, ?xi.1886, *F. R. M. Wilson* 950 (NSW 219134, 219137).

3. *Thelidium olivaceum* (Fr.) Körber, *Parerga lichenol.*: 382 (1863).

*Thelidium olivaceum* is already known from central and southern Europe and the U.S.A. The Australian gathering has a minutely areolate olive-brown 20–50 µm thick thallus and numerous, semi-immersed to almost superficial, 0.18–0.26 mm wide perithecia. The latter, often partly overgrown by the thallus, have a thin involucrellum that is contiguous with the sides of the colourless excipulum. The ascospores are 1-septate, usually bi-guttulate and measure 19–25 × 9–12 µm.

SPECIMEN SEEN:

Victoria — Gippsland, Limestone Creek Scenic Reserve, 36°51'40"S, 148°03'20"E, on dry sheltered limestone, alt. 950 m, 29.xi.1989, *P.M. McCarthy* 318 (MEL 1052307).

4. *Thelidium papulare* (Fr.) Arnold, *Flora, Jena* 68: 147 (1885).

Already reported from New South Wales (McCarthy 1990), this lichen is newly recorded from Victoria.

SPECIMENS SEEN:

Victoria — Gippsland, Buchan Reserve, 1 km NW of Buchan, end of track at camping ground, 37°29'35"S, 148°10'15"E, on dry sheltered limestone, alt. c. 75 m, 28.xi.1989, *P.M. McCarthy* 241, 245 (MEL 1052308, 1052309); Gippsland, Limestone Creek Scenic Reserve, 36°51'40"S, 148°03'20"E, on dry sheltered limestone, alt. 950 m, 29.xi.1989, *P.M. McCarthy* 319 (MEL 1052310).

5. *Verrucaria australiensis* McCarthy, *sp. nov.*

*Thallus* crustaceus, endolithicus et inconspicuus vel subepilithicus et effusus-farinosus, foveolatus, subcinereo-viridis. *Algae* virides, cellulis globosis, 5–8 µm diametro. *Cellulae* hypharum 5–8 × 3–5 µm. *Perithecia* simplicia, semiimmersa vel fere omnino immersa, plerumque solitaria, moderate numerosa, (0.1–)0.12(–0.14) mm diametro. *Apex perithecii* rotundatus vel subacutus, ater. *Centrum* globosum, (0.08–)0.09(–0.11) mm diametro. *Excipulum* lateraliter nigrum, basaliter fuscum, prope apicem 15–20 µm crassum, prope basem 12–15 µm crassum. *Periphyses* 14–17 × 2–3 µm. *Paraphyses* evanescentes. *Gelatinum hymenii* J+ rufum. *Asci* bitunicati, clavati vel cylindro-clavati, 8-sporei, 30–45 × 12–16 µm. *Ascosporeae* simplices, incolorate, ellipsoideae vel elongatae-ellipsoideae, (9.7–)11.7(–14.1) × (4.7–)5.8(–6.8) µm, contentis hyalinis, plerumque guttulis.

HOLOTYPUS: South Australia, Eyre Peninsula, 17 miles S of Cowell, by the Lincoln Highway, on a limestone erratic, 23.x.1970, *R.B. Filson* 11796 (MEL 117716).

*Thallus* crustose, endolithic and inconspicuous to sub-epilithic and effuse-farinose, pale grey-green. *Algae* green, globose, 5–8 µm diam. *Hyphal cells* 5–8 ×

3–5  $\mu\text{m}$ . *Perithecia* simple, semi-immersed to almost completely immersed, usually solitary, moderately numerous, (0.1–)0.12(–0.14) mm diam, leaving pits in the rock following their decay. *Perithecial apex* rounded to somewhat pointed, black. Ostiole inconspicuous. *Centrum* globose, (0.08–)0.09(–0.11) mm diam. *Excipulum* black at the sides, brown at the base, 15–20  $\mu\text{m}$  thick near the apex, 12–15  $\mu\text{m}$  thick at the base; cells 6–8  $\times$  3–4  $\mu\text{m}$ . *Periphyses* 14–17  $\times$  2–3  $\mu\text{m}$ . *Paraphyses* evanescent. *Hymenial gel* I+ red-brown. *Asci* bitunicate, clavate to cylindro-clavate, 8-spored, 30–45  $\times$  12–16  $\mu\text{m}$ . *Ascospores* simple, colourless, ellipsoid to elongate-ellipsoid, (9.7–)11.7(–14.1)  $\times$  (4.7–)5.8(–6.8)  $\mu\text{m}$  (40 individuals measured), usually guttulate; contents clear. (Fig. 2)

#### DISCUSSION:

Only *Verrucaria australiensis* and two other known species possess the combination of very small simple perithecia and minute ascospores. *Verrucaria simplex* McCarthy, from Great Britain, has perithecia similar to those of the Australian species; however, the thallus is dark brown and gelatinous-epilithic. In contrast, *V. lovcenensis* Servit, known from a single Yugoslavian collection, while having an endolithic habit, has larger perithecia and ascospores 8–11  $\mu\text{m}$  wide.

#### 6. *Verrucaria baldensis* Massal., *Ric. auton. lich. crost.*: 173 (1852).

This lichen is reported for the first time from Tasmania and the Australian Capital Territory.

#### SPECIMENS SEEN:

*Tasmania* — Bass Strait, Furneaux Group, Flinders Island c. 200 m W of Barclay's Sugarloaf, alt. 140 m, on limestone, 23.xii.1966, *J.S. Whinray* (MEL 28057; with *Xanthoria ligulata*); Kents Group, Deal Island, E of Brown's Bay, alt. 89 m, on limestone, 2.xii.1971, *J.S. Whinray* (MEL 1012594); Hogans Group, Hogan's Island, alt. 4–5 m, on a limestone outcrop, 27.xii.1973, *J.S. Whinray* (MEL 1012974).

*Australian Capital Territory* — Paddy's R., 17 km SW of Canberra, 35°20'S, 148°56'E, on exposed limestone outcrop in open woodland, alt. 500 m, 16.xii.1979, *H. Sreimann* 9759 (CBG 8000617).

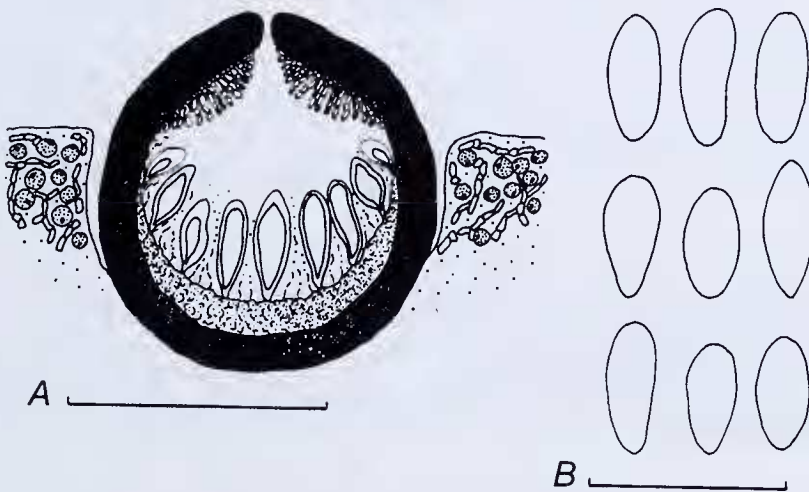


Fig. 2. *Verrucaria australiensis*. A — vertical section of perithecium; scale 0.1 mm. B — ascospores; scale 20  $\mu\text{m}$ .

7. *Verrucaria dufourii* DC., *Flor. Franc.* 2: 318 (1805).

This is very much a cosmopolitan lichen of hard limestones in Eurasia; it is also known from North America. Previously unrecorded in the Southern Hemisphere, *Verrucaria dufourii* is one of the few species that can usually be identified on the basis of its macroscopic features alone. The perithecia of the Tasmanian specimen are semi-immersed, have a thick 0.3–0.4 mm diameter involucrellum and a flattened or excavate apex. The thallus is pale grey and subepilithic.

SPECIMEN SEEN:

Tasmania — Bass Strait, Kents Group, Deal Island, alt. 155 m, on a low limestone outcrop among tussock grass, 8.xii.1971, *J.S. Whinray* (MEL 1012601)

8. *Verrucaria glaucina* Ach., *Lich. univ.*: 675 (1810).

*Verrucaria glaucina* is a reasonably common calcicolous lichen in much of Eurasia; it is also known from the mid-western and western United States. The 5 mm wide thallus found on moderately shaded limestone in Gippsland, Victoria is grey-brown in colour, deeply rimose-areolate and is subtended by a black hypothallus; the walls of the angular 0.2–0.4 mm wide areolae are also black, but not the margins of the areolar plateaux. The perithecia have a diameter of 0.1–0.15 mm and an involucrellum that merges with the hypothallus. The ascospores measure 10–16 × 6–9  $\mu$ m.

SPECIMEN SEEN:

Victoria — Gippsland, 500 m NNW of Buchan, The Bluff, 37°29'35"S, 148°10'15"E, on limestone, alt. 75 m, 28.xi.1989, *P.M. McCarthy* 267 (MEL 1052311).

9. *Verrucaria hydrela* Ach., *Syn. Lich.*: 94, 339 (1814).

The CBG specimen of *V. hydrela*, collected and tentatively identified by D. Verdon, is the first record of this aquatic lichen from the Southern Hemisphere.

The thallus is very thin, continuous, gelatinous when wetted and dark green in colour. While most perithecia retain their characteristic thalline covering to maturity, some are quite bare. The spreading involucrellum has a diameter of 0.25–0.45 mm, the excipulum remains hyaline or pale brown and the ascospores measure 17–25(–27) × 7.5–10  $\mu$ m.

Regarding the Victorian material, the Mount Cole specimens were gathered from margins of a fast-flowing mountain creek and have green to greenish-black thalli and perithecia of 0.25–0.5 mm; the ascospores measure 17–24 × 8–12  $\mu$ m. In contrast, the East Gippsland material is somewhat problematical insofar as the ascospores, being 10–14  $\mu$ m broad, approach those of *V. margacea* Wahlenb. However, in terms of their thalli and perithecia, their identity is not in doubt.

SPECIMENS SEEN:

Australian Capital Territory — Booth Range, Boboyan Road, Mt Clear camping ground, near junction of Grassy and Naas Creeks, 24 km SSW of Canberra, 35°53'S, 149°00'E, alt. 1100 m, on aquatic schistose rocks, 14.xi.1981, *D. Verdon* 5036 (CBG 8113173).

Victoria — Western Region, Mt Cole State Forest, Sandy Creek, below waterfall, 1.5 km NE of Wareek Cemetary, 37°15'S, 143°12'E, alt. 560 m, on aquatic quartzite, granite and basalt, 9.x.1989, *P.M. McCarthy* 39, 40 (MEL 1052312, 1052313); Gippsland, Limestone Creek Scenic Reserve, 36°51'40"S, 148°03'20"E, on inundated granite boulders at creek-edge, alt. 950 m, 29.xi.1989, *P.M. McCarthy* (MEL 1052314).

10. *Verrucaria hydrela* var. *puncticulata* McCarthy, var. *nov.*

Sicut var. *hydrela* sed thallus rimosus vel sparsim areolatus, viridi-niger vel cinereo-niger, 0.03–0.15 mm crassus, punctulis numerosis coalescentibus.

TYPUS: Australia, Victoria, Tyers area, White's Creek, 1 km upstream of its confluence with Tyers R., 38°06'20"S, 146°25'50"E, on inundated and submerged siltstone, alt. c. 120 m, 19.iv.1989, P. M. McCarthy 5 (HOLOTYPUS: MEL 117709; ISOTYPUS: HO).

*Thallus* crustose, epilithic, rimose to sparingly areolate, green-black to grey-black, paler in deep shade, not gelatinous when wetted, 0.03–0.15 mm thick, forming 2–20 cm wide patches; surface smooth, more or less matt, with numerous circular or ellipsoid 20–40  $\mu\text{m}$  wide black punctulae that may coalesce to form sinuous 0.1–0.2  $\times$  0.02–0.04 mm lines; the punctulae become more numerous as the thallus ages. *Areolae* usually develop around perithecia, (0.3–)0.8(–1.2) mm wide, angular. *Cortex* prosoplectenchymatous, 6–9(–10)  $\mu\text{m}$  thick; cells thick-walled, 3–4(–5)  $\mu\text{m}$  diam. *Algal layer* (20–)30–50(–60)  $\mu\text{m}$  deep; cells green, globose to ellipsoid, 4–7(–9)  $\times$  4–6  $\mu\text{m}$ ; interstitial hyphae thick-walled, 3–4(–5)  $\mu\text{m}$  diam. *Medulla* becoming carbonized; hyphae thick-walled, closely packed, 3–6  $\mu\text{m}$  diam. *Prothallus* brown-black, visible as a basal layer, not extending beyond the margin. *Perithecia* compound, semi-immersed, numerous, usually solitary, often covered by a thin thalline layer almost to the apex. *Ostiole* sunken in a concavity 0.05–0.15 mm wide. *Involucrellum* (0.3–)0.5(–0.8) mm diam., contiguous with or arching away from the excipulum, dimidiate or extending to the excipulum-base level, black, 50–100  $\mu\text{m}$  thick; the extent of penetration by the involucrellum is difficult to assess, since it merges with carbonized thalline hyphae. *Centrum* globose, (0.18–)0.25(–0.30) mm diam. *Excipulum* pale to dark brown, (10–)12–15(–18)  $\mu\text{m}$  thick; cells 6–12  $\times$  3–5  $\mu\text{m}$ . *Periphyses* 17–22  $\times$  1–2  $\mu\text{m}$ . *Paraphyses* evanescent. *Asci* bitunicate, 8-spored, clavate to cylindroclavate, 50–65  $\times$  20–30  $\mu\text{m}$ . *Hymenial gel* I–; ascoplasma I+, red. *Ascospores* simple, colourless, ellipsoid, ovate or, rarely, subglobose, (13.5–)16.6(–20.3)  $\times$  (7.0–)9.2(–11.8)  $\mu\text{m}$  (52 individuals measured); contents coarsely granular. (Figs. 3, 4)

#### DISCUSSION:

*Verrucaria hydrela* var. *puncticulata* inhabits deeply shaded and very smooth rock surfaces in and beside of White's Creek. Although water levels in the creek were low when this lichen was first observed, it grew only on surfaces that were either submerged or continually splashed.

The new taxon may be distinguished from var. *hydrela* by the thicker punctulate thallus that becomes progressively carbonised. Punctulae may be seen even in the most recent marginal growth. They originate both internally and among hyphae close to the surface of the undifferentiated thallus (Fig. 4A). In time, they enlarge, coalesce and merge with the already blackened basal layer and with involucrella (Fig. 4B and C). Carbonization is most spectacular near perithecia where the photobiont occupies a thin discontinuous, almost vestigial, layer (Fig. 4D). It is only during this most extreme phase that the pigmented cortex is visible.

Carbonization and the upward growth of the thallus in the vicinity of perithecia may obscure the true extent of the involucrellum. Thus, in some instances, the perithecia appear to be embedded in thalline verrucae altogether lacking involucrella (Fig. 4E). However, the compound nature of the perithecia is usually unambiguous (Fig. 3, 4F).

11. *Verrucaria muralis* Ach., *Meth. Lich.*:115 (1803) — *V. rupestris* Schrader, *Spic. Fl. German.* 1: 109 (1794).

This lichen is reported for the first time from Tasmania.

#### SPECIMEN SEEN:

Tasmania — Bass Strait, Furneaux Group, Prime Seal Island, N of Northern Hill, alt. 50 m, on a limestone outcrop, 1.viii.1966, J.S. Whinray (MEL 1516752).

12. *Verrucaria nigrescens* Pers., *Ann. Bot. (Usteri)*: 14: 36 (1795).

This species is reported for the first time from New South Wales and the Australian Capital Territory.

SPECIMENS SEEN:

*New South Wales* — Limestone Valley Creek, 9 km NE of Canowindra, 33°36'S, 148°41'E, on a limestone outcrop, alt. 460 m, 8.viii.1979, H. Streimann and B. Barnsley, HS9249 (CBG 7911853).

*Australian Capital Territory* — Paddy's R., 17 km SW of Canberra, 35°20'S, 148°56'E, on an exposed limestone outcrop, alt. 500 m, 16.xii.1979, H. Streimann 9758 (CBG 8000613).

13. *Verrucaria operculata* McCarthy, *sp. nov.*

*Thallus* crustaceus, endolithicus, inconspicuus, foveolatus. *Algae* virides, cellulis globosis, 7–14  $\mu\text{m}$  diametro. *Perithecia* composita, fere omnino immersa, numerosa, solitaria. *Involucrellum* atrum, (0.2–)0.3(–0.4) mm diametro, solum apicem versus excipulo conjuncto, planum vel moderate convexum, interdum 3–5 fissuris tenuibus radiantibus. *Ostiolum* saepe impressum, 20–40(–50)  $\mu\text{m}$  diametro. *Centrum* globosum vel obpyriforme, (0.23–)0.32(–0.42) mm diametro. *Excipulum* praecipue hyalinum, sed prope apicem fuscoatrum, 35–45  $\mu\text{m}$  crassum. *Periphyses* 30–40  $\times$  1.5–2.0  $\mu\text{m}$ . *Paraphyses* evanescentes. *Asci* bitunicati, clavati, 8–spori. *Gelatinum* hymenii et ascoplasma J+ violaceus. *Ascospores* incoloratae, simplices, latae vel elongatae-ellipsoideae, (20.0–)26.0(–32.0)  $\times$  (9.4–)11.5(–14.7)  $\mu\text{m}$ , contentis subtiliter granulosis.

HOLOTYPE: South Australia, Eyre Peninsula, 17 miles S of Cowell, by the Lincoln Highway, on limestone erratics lying on the sand, mostly in semi-shade, 23.x.1970, R.B. Filson 11794 (MEL 1017961).

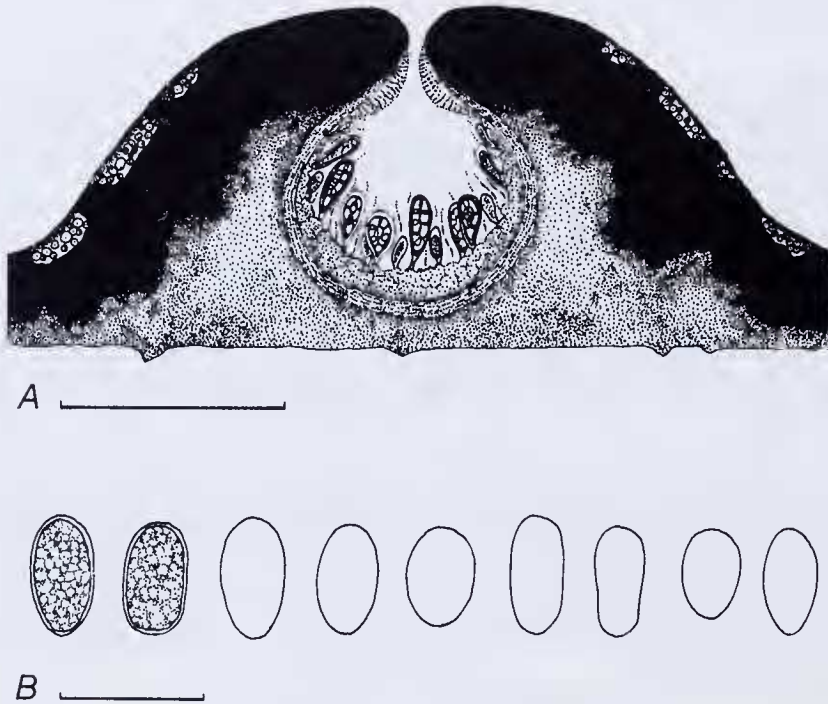


Fig. 3. *Verrucaria hydrela* var. *puncticulata*. A — vertical section of perithecium; scale 0.2 mm. B — ascospores; scale 20  $\mu\text{m}$ .



*Thallus* crustose, endolithic, inconspicuous. *Algae* green, globose, 7–14  $\mu\text{m}$  diam. *Hyphae* thick-walled, 3–4(–5)  $\mu\text{m}$  diam. *Perithecia* compound, almost completely immersed in the substratum, numerous, solitary, leaving pits in the limestone following their decay. *Involucrellum* black, (0.2–)0.3(–0.4) mm diam., joined to the excipulum only near the apex, extending laterally, then sharply downwards, occasionally with 3–5 fine fissures radiating from the ostiole, plane to slightly convex, but may become rounded and more prominent in older perithecia. *Ostiole* sunken or not, 25–40(–50)  $\mu\text{m}$  diam. *Centrum* globose to

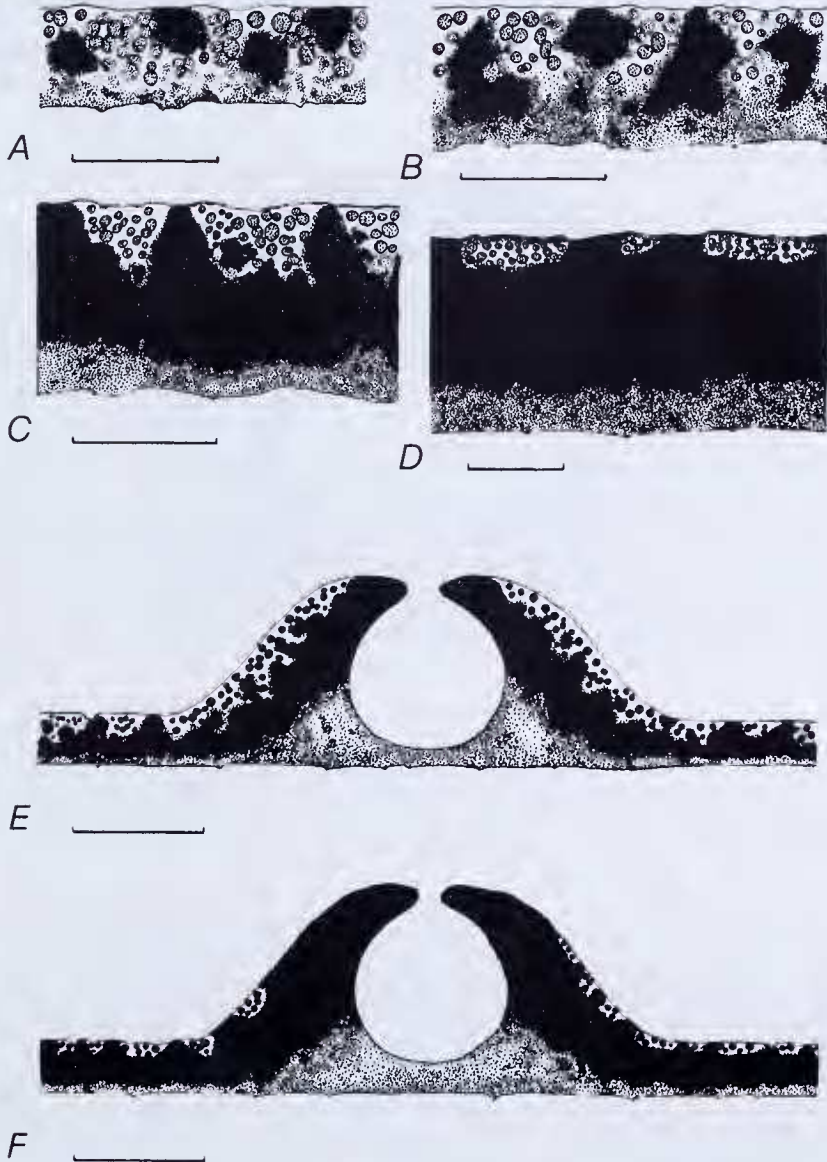


Fig. 4. *Verrucaria hydrela* var. *puncticulata*. A–D — gradual carbonization of the thallus; scales 50  $\mu\text{m}$ . E, F — vertical sections of perithecia showing variable overgrowth by the thallus and development of the involucrellum; scales 0.2 mm.

obpyriform, (0.23–)0.32(–0.42) mm diam. *Excipulum* predominantly hyaline, but brown-black near the apex, 35–45  $\mu\text{m}$  thick. *Periphyses* 30–40  $\times$  1.5–2.0  $\mu\text{m}$ . *Paraphyses* evanescent. *Asci* bitunicate, clavate, 8-spored. Numerous immature and empty asci were observed, but only one ripe individual (78  $\times$  31  $\mu\text{m}$ ). *Hymenial gel and ascoplasma* I+ violet. *Ascospores* colourless, simple, broadly to elongate-ellipsoid, (20.0–)26.0(–32.0)  $\times$  (9.4–)11.5(–14.7)  $\mu\text{m}$  (50 individuals measured); contents finely granular. (Fig. 5)

DISCUSSION:

*Verrucaria operculata* belongs to the most clearly defined and apparently natural species-group within the genus. That this group should be recognised as the genus *Bagliettoa* Massal. (syn. *Protobagliettoa* Servit) has received only sporadic support, most recently from Poelt and Vězda (1981). More general acceptance is unlikely prior to a thorough reassessment of generic relationships within the Verrucariaceae.

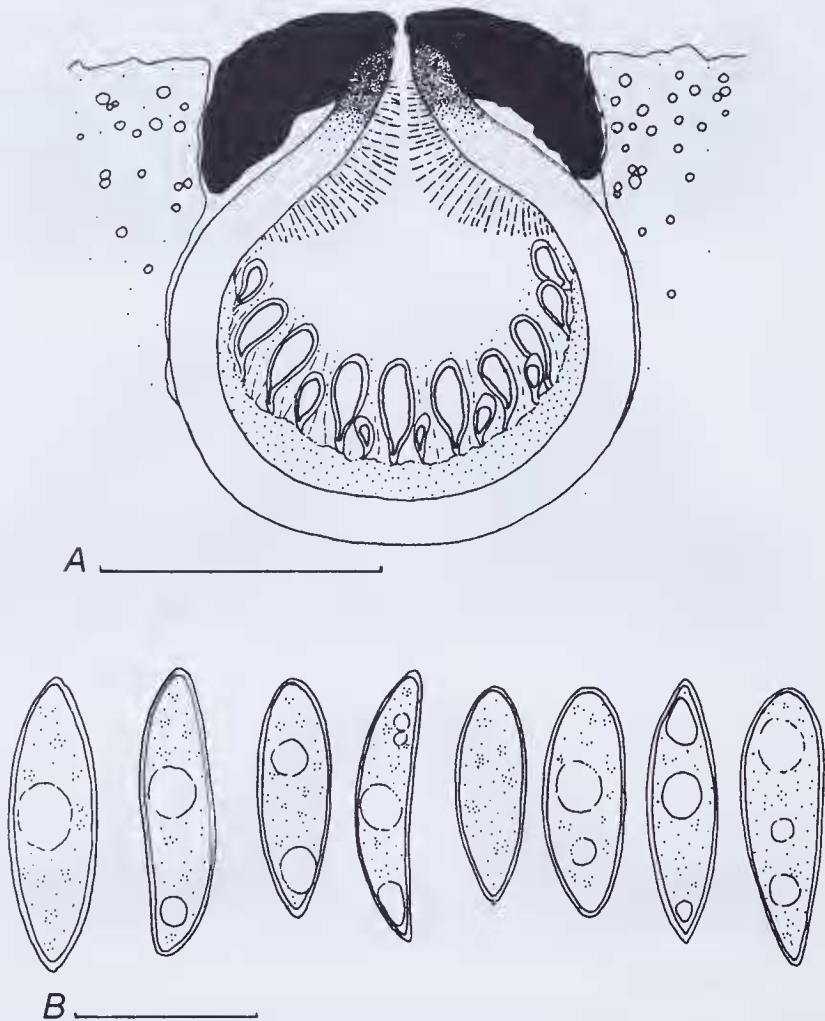


Fig. 5. *Verrucaria operculata*. A — vertical section of perithecium; scale 0.2 mm. B — ascospores; scale 20  $\mu\text{m}$ .

The *Bagliettoa*-group, already represented in Australia by *V. baldensis* Massal., is characterised by an endolithic calcicolous thallus and perithecia with a lid-like involucrellum that is comparatively loosely-attached to the apex of the excipulum. Moreover, the involucrellum frequently exhibits a delicate radial fissuring.

*Verrucaria operculata* features unusually large perithecia and ascospores. The involucrellum surrounds an inconspicuous or sunken ostiole and, importantly, is appreciably narrower than the (0.3-)0.4(-0.5) mm diameter excipulum that is invariably hyaline or very pale brown. Similar ascospores are found in the southern European *V. limborioides* (Massal.) Clauzade & Roux. That lichen, however, possesses a prominent ostiolar protuberance on an involucrellum that is consistently broader than the excipulum. The latter has a diameter of 0.3-0.35 mm and ranges in colour from pale to dark brown (Clauzade & Roux 1985, Poelt & Vězda 1981).

#### OTHER SPECIMEN EXAMINED:

South Australia — Yudnapinna Station, on limestone, 26.vi.1965, *R. W. Rogers* 32 (AD 20548).

#### 14. *Verrucaria striatula* Wahlenb., in *Ach. Meth. Lich.*: 21 (1803).

*Verrucaria striatula*, a green subgelatinous lichen of the upper littoral zone on rocky seashores, is recorded from Australia for the first time. It is distinguished by a thallus from which develop glossy elongate and often branched carbonaceous ridges and by its 0.2-0.3 mm diameter perithecia with a dimidiate to sub-entire involucrellum that becomes flattened or markedly excavate at its apex. The ascospores measure  $7-11 \times 4-7 \mu\text{m}$ .

Whereas *V. striatula* is a common lichen on seashores in temperate and boreal regions of the Northern Hemisphere, Santesson (1939) described a new subspecies *australis* based on specimens from New Zealand. The latter displays a more effuse thallus margin, ridges with acute apices and more elongate algae than those of the palearctic subspecies. The specimens cited below correspond to *V. striatula* as it is known from European and North American coasts. Thus, the thallus margin ranges from determinate to effuse and only a minority of ridge-apices are acute; neither do the dimensions of the photobiont cells differ appreciably.

#### SPECIMENS SEEN:

Victoria — Warrnambool, supralittoral limestone, 16.viii.1949, *Bennett & Pope* (AD 20708); Mornington Peninsula, Blairgowrie, Cape Schanck Coastal Park, Spray Point, on calcareous sandstone in the upper littoral, 5.i.1990, *P.M. McCarthy* 353 (MEL, HO, NSW, QLD).

Tasmania — Tasman Peninsula, Half Moon Bay, 40°44'S, 145°17'E, 6.xii.1961, *J.E.S. Townrow* (HO 65418); Bass Strait, Curtis Island, NW corner of island, 12.ii.1971, *R.B. Filson* 12233 (MEL 40175).

#### 15. *Verrucaria subdiscreta* McCarthy, *sp. nov.*

*Thallus* crustaceus, epilithicus, viridi-olivaceus vel viridi-ater, madefactus subgelatinosus, (20-)40-60  $\mu\text{m}$  crassus, vulgo areolatus, punctulis atris minutis. *Areolae* angulares, regulares vel irregulares, plerumque planae, 0.1-0.25(-0.35) mm latae; substratum inter areolas plusminusve visibilis. *Algae* virides, plusminusve columnis verticalibus dispositae; cellulae latae ellipsoideae vel globosae, 4-8(-9)  $\times$  4-6  $\mu\text{m}$ . *Perithecia* composita, semiimmersa vel fere superficialia, numerosa, plerumque solitaria. *Involucrellum* (0.12-)0.18(-0.22) mm diametro, nigrum, ad basim excipuli descendens, 30-40(-60)  $\mu\text{m}$  crassum. *Apex* perithecii plerumque rotundatus. *Centrum* globosum vel leviter obpyriforme, 0.08-0.15 mm diametro. *Excipulum* pallidofuscum vel fuscoatrum, 10-15  $\mu\text{m}$  crassum, cellulis 4-7  $\times$  2-3  $\mu\text{m}$ . *Periphyses* 10-18  $\times$  1.5-2.5  $\mu\text{m}$ . *Paraphyses* evanescentes. *Asci* bitunicati, clavati, 8-spori, 25-35  $\times$  10-14  $\mu\text{m}$ . *Gelatinum hymenii et ascoplasma* J-. *Ascosporae* simplices, incoloratae, ellipsoideae vel elongatae-ellipsoideae, (8.8-)11.5(-14.8)  $\times$  (3.8-)5.0(-6.4)  $\mu\text{m}$ , contentis hyalinis vel subtiliter granulosis. *Conidiomata* numerosa, semiimmersa, 40-60(-80)  $\mu\text{m}$  diametro, ostiolo depresso. *Conidia* bacilliformes, 2-3  $\times$  0.5  $\mu\text{m}$ .

HOLOTYPE: Australia, Tasmania, Hunters Island, Big Duck Bay, on quartzite, "on coast", 5.xi.1973, T.B. Muir 5245 (MEL 1021253).

*Thallus* crustose, epilithic, olive-green to green-black (dull green in shade), subgelatinous and somewhat translucent when wetted, (20-)40-60  $\mu\text{m}$  thick, may form colonies 3-5 cm wide, usually areolate, occasionally rimose, rarely effuse to continuous, dotted with carbonaceous punctulae, 15-30  $\mu\text{m}$  wide. *Areolae* angular, regular or irregular, deeply divided such that the substratum is faintly visible between areolae, matt, smooth, usually plane, occasionally slightly concave or convex, 0.1-0.25(-0.35) mm wide. *Algae* in more or less vertical columns, green; cells broadly ellipsoid to globose, 4-8(-9)  $\times$  4-6  $\mu\text{m}$ . *Hyphae* 2-3  $\mu\text{m}$  diam., thick-walled. The thallus is sometimes covered by a 3-7  $\mu\text{m}$  deep hyaline amorphous layer subtended by a 6-8  $\mu\text{m}$  deep brown-pigmented layer. *Perithecia* compound, semi-immersed to almost superficial, numerous, usually solitary, occasionally in groups of 2-3. *Involucrellum* 0.12-0.18(-0.22) mm diam., matt or glossy black, extending to exciple-base level, either contiguous with the excipulum or arching away from it, 30-40(-60)  $\mu\text{m}$  thick. *Apex* usually rounded. *Ostiole* inconspicuous to slightly depressed. *Excipulum* pale to dark brown, 10-15  $\mu\text{m}$  thick; cells 4-7  $\times$  2-3  $\mu\text{m}$ . *Centrum* globose to somewhat obpyriform, 0.08-0.15 mm diam. *Periphyses* 10-18  $\times$  1.5-2.5  $\mu\text{m}$ . *Paraphyses* evanescent. *Asci* bitunicate, clavate, 8-spored, 25-35  $\times$  10-14  $\mu\text{m}$ . *Hymelial gel and ascoplasma* I-. *Ascospores* simple, colourless, ellipsoid to elongate-ellipsoid, (8.8-)11.5(-14.8)  $\times$  (3.8-)5.0(-6.4)  $\mu\text{m}$  (60 individuals measured); contents clear to finely granular. *Conidiomata* numerous, semi-immersed, 40-60(-80)  $\mu\text{m}$  diam., with a black exposed surface that is depressed at the ostiole. *Conidia* bacilliform, 2-3  $\times$  0.5  $\mu\text{m}$ . (Fig. 6)

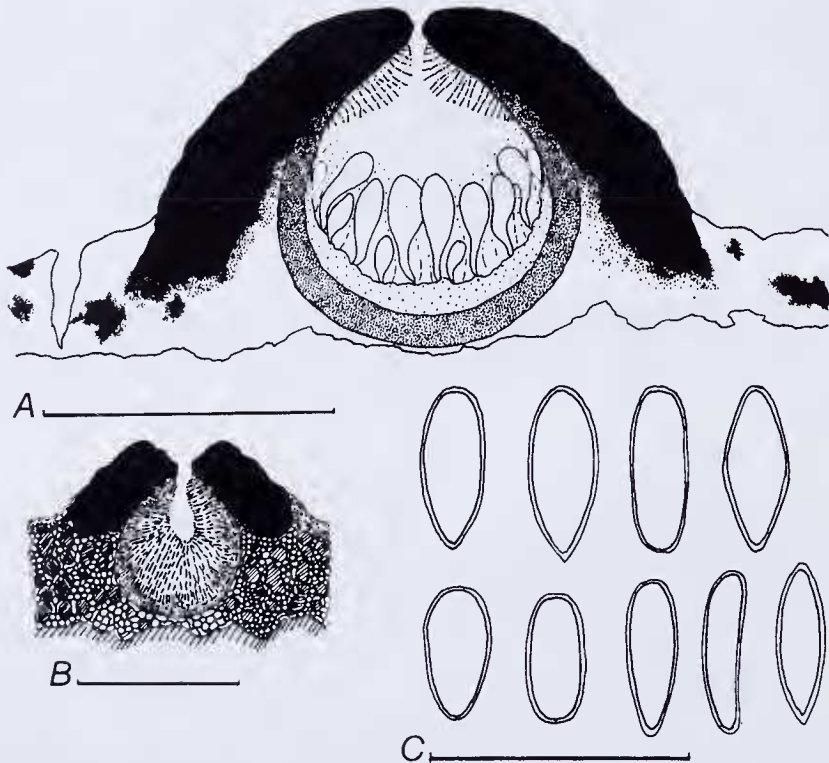


Fig. 6. *Verrucaria subdiscreta*. A — vertical section of perithecium; scale 0.1 mm. B — vertical section of conidioma and adjacent thallus; scale 50  $\mu\text{m}$ . C — ascospores; scale 20  $\mu\text{m}$ .

## DISCUSSION:

The distinctiveness of *Verrucaria subdiscreta* lies in the combination of a thin areolate thallus, carbonaceous puncticulae, small prominent perithecia and small, rather than minute, ascospores. An inhabitant of a broad range of rock types at and above high water level, it is more maritime than marine. Thus, it occupies a niche not unlike that of the cosmopolitan *V. maura* Wahlenb. The latter, however, possesses a thicker thallus, perithecia of 0.25–0.5 mm diameter and ascospores of  $12\text{--}20 \times 6\text{--}10 \mu\text{m}$ . In terms of the perithecia and their contents, *V. subdiscreta* is closer to the lower to mid-littoral *V. halizoa* and *V. microsporoides*. However, the integrity of *V. subdiscreta* is supported both by ecological barriers and significant thalline differences. The Antarctic *V. dispartita* Vainio has a black scabrid non-puncticulate thallus on which are clustered 1–3 0.2–0.3 mm diam. semi-immersed perithecia (Lamb 1948); the latter are significantly larger than those of *V. subdiscreta*.

## OTHER SPECIMENS EXAMINED:

*Western Australia* — Point Peron, limestone undercut in splash zone, 12.vii.1970, *N. Sammy* (MEL 38521).

*South Australia* — Robe,  $37^{\circ}10'S$ ,  $139^{\circ}45'E$ , on exposed supralittoral rocks, 17.viii.1953, *H.B.S. Womersley* (AD 20700); Kangaroo Island, Emu Bay,  $35^{\circ}35'S$ ,  $137^{\circ}31'E$ , on supralittoral rocks, 26.i.1957, *H.B.S. Womersley* (AD 20533); Streaky Bay, c. 1.6 km NW of town, on supralittoral rocks, 10.ii.1954, *H.B.S. Womersley* (AD 20696); 24 km S of Port Lincoln, Whaler's Way Fence, SW of Fisheries Bay, on gneiss, "below H(igh) W(ater) M(ark)", 23.x.1970, *R.B. Filson 11811* (MEL 117722); Eyre Peninsula, 8 km W of Sheringa, "on cliffs at small beach, growing on limestone high above high water", 25.x.1970, *R.B. Filson 11885* (MEL 117711).

*Victoria* — Near Warrnambool, Hopkins Mouth, 22.viii.1986, *W.H. Ewers* (MEL 117713); Mornington Peninsula, Blairgowrie, Cape Schanck Coastal Park, Spray Point, on calcareous sandstone, at high water mark, 5.i.1990, *P.M. McCarthy 352* (MEL).

*Tasmania* — Bass Strait, Furneaux Group, Babel Island, 45–90 m SE of the eastern end of the South-east Beach, 0.3–3 m above High Water, c. 45 m inland, on granite, 21.i.1967, *J.S. Whinray & M. Christie* (MEL 28066); Bass Strait, Flinders Island, The Bluff, 2.5 km NNW of Whitemark Village, alt. 0.3–0.9 m, on quartzite, 23.iv.1969, *J.S. Whinray* (MEL 1019456); Bass Strait, Kents Group, Erith Island, Bulli Bay sand beach, limestone outcrop 2.5–4.5 m in from HWL, alt. 1.8 m, 16.xii.1970, *J.S. Whinray* (MEL 1012874); Bass Strait, Curtis Island, gulch on NE side of the island, on granite,

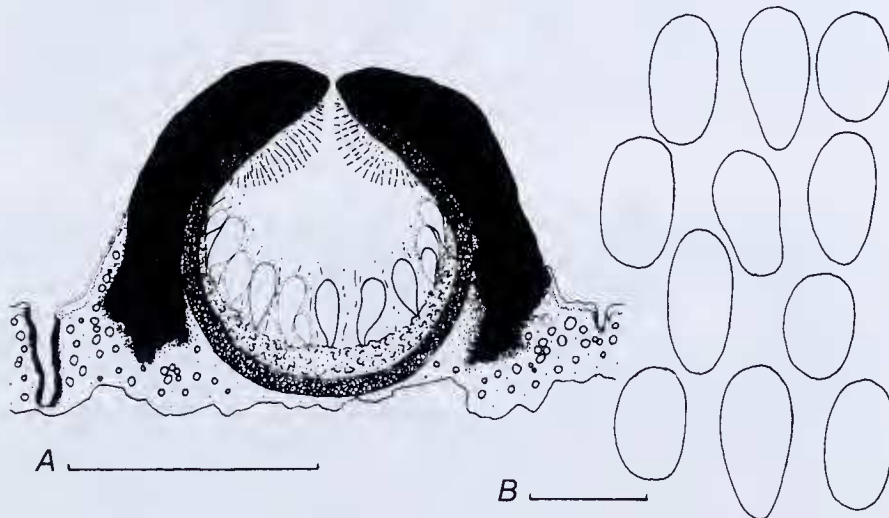


Fig. 7. *Verrucaria tessellatuloidea*. A — vertical section of perithecium; scale 0.2 mm. B — ascospores; scale  $10 \mu\text{m}$ .

"growing at (high) water level and above...grades into *Caloplaca* zone and...along watercourses"; 9.ii.1971, R.B. Filson 12094 (MEL 40248); Curtis Island, around the northern cove and the hill above, on granite, "collected at sea level"; 12.ii.1971, R.B. Filson 12234 (MEL 40233); Cape Sorell, c. 42°12'S, 145°10'E, west-facing quartzite on the foreshore, ?v.1971, J.E.S. Townrow (HO 39999).

Macquarie Island — Nuggets Point, alt. 40 feet, 18.iii.1964, R.B. Filson 6355 (MEL 20418); Aurora Point, "loose scree fragments in long grass"; alt. 70 feet, 7.xi.1965, K. Simpson E92 (MEL 1000269); Bauer Bay, alt. 5–10 feet, 10.i.1972, R. Hnatiuk 11710 (MEL 1027296).

### 16. *Verrucaria tessellatuloidea* McCarthy, *sp. nov.*

*Thallus* crustaceus, epilithicus, griseo-fuscus vel virido-fuscus, rimosus vel areolatus, 50–100(–150)  $\mu\text{m}$  crassus, laevis, hebetatus vel nitidus. *Areolae* angulares, planae vel leviter convexae, aliquando rimulosae, 0.2–1.0 mm latae; parietes rimarum denigrati. *Stratum* supremum non cellulolum, hyalinum vel subfuscum, 5–15  $\mu\text{m}$  crassum. *Algae* virides, latae ellipsoideae vel globosae, 5–11  $\times$  5–9  $\mu\text{m}$ . *Hyphae* 3–4  $\mu\text{m}$  diametro. *Perithecia* composita, 1/3–2/3 immersa, numerosa, plerumque solitaria. *Apex* perithecii rotundatus vel complanatus vel profunde concavum. *Ostiolum* fuscum, 30–100  $\mu\text{m}$  latum. *Involucrellum* ad basim excipuli descendens, aliquando dimidiatum, nigrum, 0.22–0.35(–0.45) mm diametro, 50–75(–100)  $\mu\text{m}$  crassum. *Centrum* globosum, 0.12–0.20(–0.25)  $\mu\text{m}$  diametro. *Excipulum* lateraliter fuscum vel fusco-atrum, basaliter pallido-fuscum vel fusco-atrum, 18–25  $\mu\text{m}$  crassum, cellulis 6–9  $\times$  2–3  $\mu\text{m}$ . *Periphyses* 25–45  $\times$  1  $\mu\text{m}$ . *Paraphyses* evanescentes. *Asci* bitunicati, clavati, 8-sporei, 30–38  $\times$  10–14  $\mu\text{m}$ . *Gelatinum hymenii* J–; ascoplasma J+ rufum. *Ascospores* simplices, incoloratae, ellipsoideae vel latae ellipsoideae, (7.9–)9.8(–11.8)  $\times$  (4.7–)5.9(–6.8)  $\mu\text{m}$ , contentis hyalinis vel subtiliter granulosis.

HOLOTYPE: Australia, Tasmania, Cape Bruny, 43°30'S, 147°09'E, on dolerite in sheltered crevices, 7.viii.1971, G.C. Bratt 71/1089 (HO 39998).

*Thallus* crustose, epilithic, grey-brown to green-brown, rimose to areolate, 50–100(–150)  $\mu\text{m}$  thick; surface smooth, dull or glossy. *Areolae* angular, plane to slightly convex, occasionally rimulose, 0.2–1.0 mm wide; rimae with blackened walls. *Thallus* covered by a 5–15  $\mu\text{m}$  thick hyaline to pale brown non-cellular layer. *Algae* green, broadly ellipsoid to globose, 5–11  $\times$  5–9  $\mu\text{m}$ . *Hyphae* thin-walled, 3–4  $\mu\text{m}$  diam. *Perithecia* compound, 1/3–2/3 immersed, numerous, usually solitary. *Apex* rounded, almost plane or deeply concave. *Ostiole* brown, 30–100  $\mu\text{m}$  wide. *Involucrellum* usually extending to excipulum-base level, occasionally dimidiate, black, 0.22–0.35(–0.45) mm diam., 50–75(–100)  $\mu\text{m}$  thick. *Centrum* globose, 0.12–0.20(–0.25) mm diam. *Excipulum* brown to brown-black at the sides, pale brown to brown-black at the base, 18–25  $\mu\text{m}$  thick; cells 6–9  $\times$  2–3  $\mu\text{m}$ . *Periphyses* 25–45  $\times$  1  $\mu\text{m}$ . *Paraphyses* evanescent. *Asci* bitunicate, 8-spored, clavate, 30–38  $\times$  10–14  $\mu\text{m}$ . *Hymenial gel* I–; ascoplasma I+ red-brown. *Ascospores* simple, colourless, ellipsoid to broadly ellipsoid, (7.9–)9.8(–11.8)  $\times$  (4.7–)5.9(–6.8)  $\mu\text{m}$  (60 individuals measured); contents clear to finely granular. (Fig. 8)

#### DISCUSSION:

That *V. tessellatuloidea* merits the designation 'maritime' is probable though not certain. Thus, the holotype is associated with, among others, several thalli of *Verrucaria* aff. *maura*, while the Cape Sorell specimen (below) adjoins some shaded thalli of *V. subdiscreta* as well as two *Caloplaca* spp. and a *Lecidea* s. lat. In spite of association with unequivocally maritime *Verrucariae*, the possibility exists that these collections represent the intrusion of a predominantly terrestrial lichen on to the seashore.

In terms of its habit, the new lichen bears resemblance to *V. tessellatula* Nyl., a supralittoral species known from islands in the South Atlantic and South Indian oceans as well as Tierra del Fuego (Redon 1985) and Macquarie Island. Both have a conspicuous grey-brown to green-brown areolate thallus. More importantly, they share an unusual feature, namely a blackening of the walls of thalline cracks in the absence of a blackened basal layer or prothallus. Unlike *V. tessellatuloidea*, however, Nylander's species possesses 0.15–0.20 mm diameter perithecia that are almost entirely immersed in the thallus. Moreover, the involucrellum is a thin

apical structure and the lateral and basal walls of excipulum are invariably colourless. The ascospores measure  $11-15 \times 6.5-9 \mu\text{m}$  (Lamb 1948).

OTHER SPECIMEN EXAMINED:

Tasmania — Cape Sorell, west facing quartzite on foreshore, ?v.1971, J.E.S. Townrow (HO 39999).

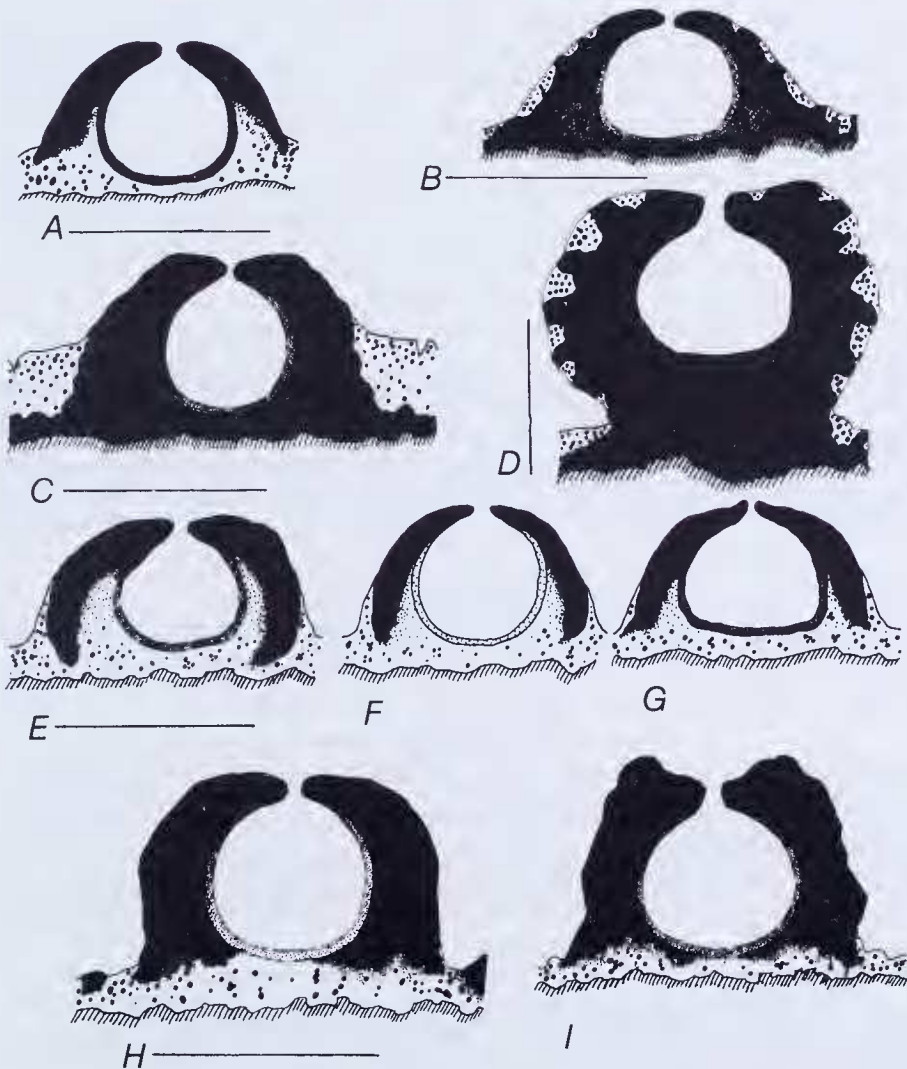


Fig. 8. Sectioned perithecia of some marine and maritime Verrucariae. A — *V. halizoa*; B-D — *V. maura*; E-G — *V. microsporoides*; H, I — *V. striatula*. Scales 0.2 mm.

KEY TO THE MARINE AND MARITIME SPECIES OF *VERRUCARIA* IN AUSTRALIA

1. Thallus with 0.05–0.1 mm wide glossy black often branched carbonaceous ridges, thin, green to green-black, gelatinous when wetted. Perithecia almost superficial, 0.2–0.3 mm diam.; involucrellum thick, apex becoming flattened or excavate; excipulum colourless to brown (Fig. 8H, I). Ascospores  $7\text{--}11 \times 4\text{--}7 \mu\text{m}$ . Mid-littoral to supralittoral, Vic., Tas. .... *V. striatula*
1. Thallus without carbonaceous ridges ..... 2
2. Thallus continuous to sparingly rimose; lower to mid-littoral species ..... 3
2. Thallus richly rimose to areolate; upper littoral to supralittoral species ..... 4
3. Ascospores  $7.5\text{--}11 \times 4.5\text{--}6 \mu\text{m}$ . Thallus thin, continuous, smooth, green to green-black, becoming gelatinous when wetted. Perithecia 1/3 immersed to almost superficial, 0.18–0.28 mm diam. (Fig. 8A). Lower littoral, Qld  
..... *V. halizoa*
3. Ascospores  $11\text{--}16(\text{--}18) \times 4\text{--}6(\text{--}8) \mu\text{m}$ . Thallus thin, continuous to sparingly rimose, black. Perithecia semi-immersed to almost superficial, 0.15–0.3 mm diam. (Fig. 8E–G).  
Lower to mid-littoral, W.A., N.S.W., Vic., Tas. .... *V. microsporoides*
4. Ascospores  $12\text{--}20 \times 6\text{--}8 \mu\text{m}$ . Perithecia 0.25–0.5 mm diam., semi-immersed to almost superficial, partly overgrown by the thallus; excipulum colourless to brown-black (Fig. 8B–D). Thallus areolate, 0.1–0.7 mm thick, green-black to black, black-punctulate, with a dark brown to black basal layer. Upper littoral to supralittoral, W.A., Vic., Tas. .... *V. maura*
4. Ascospores  $8\text{--}15 \times 4\text{--}7 \mu\text{m}$  ..... 5
5. Perithecia 0.12–0.22 mm diam. Thallus olive-green to green-black, black-punctulate; areolae 0.1–0.35 mm wide. Ascospores  $9\text{--}15 \times 4\text{--}6.5 \mu\text{m}$ . Upper littoral to supralittoral, W.A., S.A., Vic., Tas. .... *V. subdiscreta*
5. Perithecia 0.22–0.35(–0.45) mm diam. Thallus grey-brown to green-brown, lacking punctulae; areolae 0.2–1.0 mm wide, with blackened sides. Ascospores  $8\text{--}12 \times 4.5\text{--}7 \mu\text{m}$ . Supralittoral, Tas. .... *V. tessellatuloidea*

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